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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/593,556	09/20/2006	Michitaka Ohtaki	062925	4920

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EXAMINER	
SALZMAN, KOURTNEY R	

ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
11/25/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentmail@whda.com

Office Action Summary	Application No.	Applicant(s)	
	10/593,556	OHTAKI, MICHITAKA	
	Examiner	Art Unit	
	KOURTNEY R. SALZMAN	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 July 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,6 and 14-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 6 and 14-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed on July 9, 2009 has been entered and fully considered.

2. Claims 1 and 6 are currently amended. Claims 7, 8, 12 and 13 are cancelled. Claims 16 and 17 have been added.

3. Claims 1, 6 and 14-17 are currently pending and have been fully considered.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 6, 16 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by OHTAKI et al (Ohtaki, Michitaka, Sayaka Maehara, and Shinichirou Shinge. "Thermoelectric Properties of Al-doped ZnO Sintered With Nanosized Void Forming Agents." Proc. of 22nd International Conference on Thermoelectrics. *IEEE* 2003: 171-74.)

Regarding claim 1, microparticles of PMMA (a void forming agent, with average diameter 430 nm or 150 nm) are mixed with Al-doped ZnO (thermoelectric conversion material in powder form) as discussed in the last paragraph on page 171 in the section of OHTAKI et al titled “Experimental”. The powder is shaped into a pellet and sintered for ten hours, as described further in this section. Since it is not stated that the two steps of forming and heating must be performed

simultaneously, it would have been clear that one is able to perform the steps either in order or simultaneously. The final product is stated in section 3.2 "Nanovoid formation by VFA" to have the PMMA beads burned out creating "densely sintered matrices". The "burning out" of the PMMA beads is the occurrence of gasifying and removing the void forming agent. Since OHTAKI et al teaches the final product to be densified and sintered, it is clear that during the heating process (as the temperature of the body rises) both densification and sintering occur. The removal of the void forming agent during heating would not happen all at once therefore, the occurrence of densification and the void forming agent being not substantially gasified is clearly anticipated. Due to the relative nature of the content of void forming agent (i.e., substantially), there is no teaching to indicate this is not the case. Furthermore, the claim language does not require two tangible independent heating steps. Instead the claim requires that while the body is being heated, sintering and densification occurs. Since the specification does not specify these steps to happen discretely, it is a clear conclusion that the densification happens during the heating. There is no temperature requirement listed in the claims to require the densification and sintering to happen during different heating processes or conditions.

Regarding claim 6, microparticles of PMMA (a void forming agent, with average diameter 430 nm or 150 nm) are mixed with Al-doped ZnO (thermoelectric conversion material in powder form) as discussed in the last paragraph on page

171 in the section of OHTAKI et al titled “Experimental”. The powder is shaped into a pellet and sintered for ten hours, as described further in this section. Since the steps are listed as pressing into pellet form and sintering, it allows for the two steps to occur simultaneously, as listed in the claim. The final product is stated in section 3.2 “Nanovoid formation by VFA” to have the PMMA beads burned out creating “densely sintered matrices”. The “burning out” of the PMMA beads is the occurrence of gasifying and removing the void forming agent. Since OHTAKI et al teaches the final product to be densified and sintered, it is clear that during the heating process (as the temperature of the body rises) both densification and sintering occur. The removal of the void forming agent during heating would not happen all at once therefore, the occurrence of densification and the void forming agent being not substantially gasified is clearly anticipated. Due to the relative nature of the content of void forming agent (i.e., substantially), there is no teaching to indicate this is not the case. Furthermore, the claim language does not require two tangible independent heating steps. Instead the claim requires that while the body is being heated, sintering and densification occurs. Since the specification does not specify these steps to happen discretely, it is a clear conclusion that the densification happens during the heating. There is no temperature requirement listed in the claims to require the densification and sintering to happen during different heating processes or conditions.

Regarding claim 16, microparticles of PMMA (a void forming agent, with average diameter 430 nm or 150 nm) are mixed with Al-doped ZnO (thermoelectric conversion material in powder form) as discussed in the last paragraph on page 171 in the section of OHTAKI et al titled "Experimental". The powder is shaped into a pellet and sintered for ten hours, as described further in this section. Since it is not stated that the two steps of forming and heating must be performed simultaneously, it would have been clear that one is able to perform the steps either in order or simultaneously. The final product is stated in section 3.2 "Nanovoid formation by VFA" to have the PMMA beads burned out creating "densely sintered matrices". The "burning out" of the PMMA beads is the occurrence of gasifying and removing the void forming agent. Since OHTAKI et al teaches the final product to be densified and sintered, it is clear that during the heating process (as the temperature of the body rises) both densification and sintering occur. The removal of the void forming agent during heating would not happen all at once therefore, the occurrence of densification and the void forming agent being not substantially gasified is clearly anticipated. Due to the relative nature of the content of void forming agent (i.e., substantially), there is no teaching to indicate this is not the case. Furthermore, the claim language does not require two tangible independent heating steps. Instead the claim requires that while the body is being heated, sintering and densification occurs. Since the specification does not specify these steps to happen discretely, it is a clear conclusion that the densification happens during the heating. There is no

temperature requirement listed in the claims to require the densification and sintering to happen during different heating processes or conditions. Regarding the limitation requiring an oxidizing atmosphere to be present, sintering in thermoelectrics is known to occur in air, causing an oxidizing environment. Moreover, while this is not explicitly listed, the presence of the zinc oxide during heating also causes an oxidizing environment for the thermoelectric material and that of the void forming agent, causing oxidation to be a method of removal during the described "burn out" of the agent.

Regarding claim 17, microparticles of PMMA (a void forming agent, with average diameter 430 nm or 150 nm) are mixed with Al-doped ZnO (thermoelectric conversion material in powder form) as discussed in the last paragraph on page 171 in the section of OHTAKI et al titled “Experimental”. The powder is shaped into a pellet and sintered for ten hours, as described further in this section. Since the steps are listed as pressing into pellet form and sintering, it allows for the two steps to occur simultaneously, as listed in the claim. The final product is stated in section 3.2 “Nanovoid formation by VFA” to have the PMMA beads burned out creating “densely sintered matrices”. The “burning out” of the PMMA beads is the occurrence of gasifying and removing the void forming agent. Since OHTAKI et al teaches the final product to be densified and sintered, it is clear that during the heating process (as the temperature of the body rises) both densification and sintering occur. The removal of the void forming agent during heating would not

happen all at once therefore, the occurrence of densification and the void forming agent being not substantially gasified is clearly anticipated. Due to the relative nature of the content of void forming agent (i.e., substantially), there is no teaching to indicate this is not the case. Furthermore, the claim language does not require two tangible independent heating steps. Instead the claim requires that while the body is being heated, sintering and densification occurs. Since the specification does not specify these steps to happen discretely, it is a clear conclusion that the densification happens during the heating. There is no temperature requirement listed in the claims to require the densification and sintering to happen during different heating processes or conditions. Regarding the limitation requiring an oxidizing atmosphere to be present, sintering in thermoelectrics is known to occur in air, causing an oxidizing environment. Moreover, while this is not explicitly listed, the presence of the zinc oxide during heating also causes an oxidizing environment for the thermoelectric material and that of the void forming agent, causing oxidation to be a method of removal during the described "burn out" of the agent.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over OHTAKI et al (Ohtaki, Michitaka, Sayaka Maehara, and Shinichirou Shinge. "Thermoelectric Properties of Al-doped ZnO Sintered With Nanosized Void Forming Agents." Proc. of 22nd International Conference on Thermoelectrics. *IEEE* 2003: 171-74.).

Regarding claims 14 and 15, all the limitations of claims 1 and 6 are taught by reference OHTAKI et al, including the size of the pores produced to be around 1-3 microns, as taught in section 3.2 "Nanovoid formation by VFA".

OHTAKI et al fails to explicitly teach the density of the voids, but does teach relative densities on page 173 at the bottom of the left column and top of the right. At the time of the invention, it would have been obvious to one of ordinary skill in the art to optimize the thermopower of the material by manipulating the void density (where the void density would function as a result effective variable), as discussed in the last two paragraphs of section 3.2.

Response to Arguments

9. Applicant's arguments with respect to claims 1, 6 and 14-17 have been considered but are moot in view of the new ground(s) of rejection.

10. The new grounds of rejection are necessitated by the amendment to the claims and the addition of the new claims.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KOURTNEY R. SALZMAN whose telephone number is (571)270-5117. The examiner can normally be reached on Monday to Thursday 6:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nam X Nguyen/
Supervisory Patent Examiner, Art Unit 1753

krs
11/19/2009